

## **REMARKS**

### **Allowable Subject Matter**

Applicants gratefully acknowledge allowability of claims 30 and 31 and the allowability of claim 12 if rewritten in independent form including all the limitations of the base claim and any intervening claims.

The newly presented claim 32 is equivalent to allowable claim 12 rewritten in independent form including all the limitations of the base claim and intervening claims. As such, it is also allowable.

### **Claim Rejections - 35 USC § 102**

Claims 1, 2 and 4-11 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,512,131 to Kumar et al. (here after Kumar et al.).

Applicant has amended claim 1 to define that **the thin film deposited by the method of the present invention is not a monolayer.**

Support for the fact that the thin films deposited by the method of the present invention are not monolayers is found in EXAMPLE 5, on page 30, lines 1-7, of the specification where the following is stated:

"The chemically differentiated substrate surface was used to define the pattern of a thin film of 50 nm silica particles deposited from a colloidal suspension (Highlink OG 113-53), produced by Clariant Corp, which incorporates isopropanol and hexamethylene diacrylate as spin-casting solvents."

Particularly on page 30, line 3, of the specification clearly refers to "a thin film of 50 nm". Thus, it is clearly understood by a person of ordinary skill in the art that **a film of 50 nm** silica particles deposited from a colloidal suspension **is not a monolayer**.

The following further supports that the thin film in the present invention **is not a monolayer**. The thin film in the present invention is a material, for example, a polymer, a hybrid material, etc., which does not require a chemical reaction with the substrate surface to form a thin film. Thus, there is not a chemical bond formed between the thin film and the substrate. The thin film in the present example is physically adsorbed, not chemically bound to the substrate (see, for example, EXAMPLE 5).

In contrast, a SAM, as described by Kumar, requires a head group that chemically binds to the substrate surface to form a monolayer, which is chemically bound to the substrate to form a monolayer that is bound to the substrate to form a single material or chemical entity. In the example of hexadecanethiol cited by the Examiner, the thiol functionality forms a chemical bond with the substrate, such as, gold. This is not **a thin film of 50 nm**, for example, of silica particles deposited from a colloidal suspension adsorbed on the surface of the substrate.

The SAM and thin film differ in the following respects. A SAM is a self-assembled monolayer. A monolayer is **one molecular layer**. It has special definition in the art. It requires a head group that chemically binds to the substrate surface. The present invention employs SAM's to pattern thin films that are **more than one molecular layer** of material and do not require chemical binding to the substrate surface. Claim 1, as amended, defines the thin films to clearly exclude such monolayers.

Further, claim 1 indicate that **the thin film layer is not a self-assembled monolayer**, but rather a thin film of an organic molecule, a short-chain organic oligomer, a long-chain organic polymer, a photoresist, an organic-inorganic hybrid material, a metallo-organic complex, a nanoparticle of metal, a nanoparticle of metal

oxide, a nanoparticle of semiconductor, a silica particle, an inorganic salt, or a mixture thereof.

Kumar et al. disclose a method of forming a patterned thin film comprising the steps of:

- (1) providing a substrate having a patterned layer of a self-assembled monolayer (SAM) thereon; and
- (2) depositing **a second self-assembled monolayer (SAM)** thereover.

In contrast to Kumar et al., instant claim 1 defines a method in which **a thin film, which is not a monolayer**, is deposited on a surface of a substrate having thereon a patterned underlayer of a self-assembled monolayer. **The thin film in claim 1 is not a self-assembled monolayer**. Instead, the thin film is clearly described to be a thin film of “an organic molecule, a short-chain organic oligomer, a long-chain organic polymer, a photoresist, an organic-inorganic hybrid material, a metallo-organic complex, a nanoparticle of metal, a nanoparticle of metal oxide, a nanoparticle of semiconductor, a silica particle, an inorganic salt, and a mixture thereof.” (see claim 1, as amended).

The method of Kumar et al. **always deposits a second self-assembled monolayer (SAM)** over a first self-assembled monolayer (SAM), a feature that is not present in instant claim 1.

The thickness of the patterned thin film material can be controlled by choosing the concentration of the thin film material or its precursors in the solution and the rate of revolution of the spinning substrate. In immersion-coating, the thickness of the patterned thin film material can be controlled by choosing the concentration of the thin film material or its precursors in solution and the rate of substrate removal from solution (for example, see pages 23-24, of the specification). These are thin films, not self-assembled monolayers (SAMs).

Accordingly, claim 1, and claims 2 and 4-11, which depend directly or indirectly from claim 1, clearly distinguish over Kumar et al. Therefore, the rejection of claims claim 1, 2 and 4-11 under 35 U.S.C. § 102(b), as being anticipated by Kumar et al. should be withdrawn.

### **Claim Rejections - 35 USC § 103**

Claim 3 is rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,512,131 to Kumar et al.

Applicant has amended claim 1 to define that **the thin film deposited by the method of the present invention is not a monolayer**. Instead of repeating, the Examiner is referred to the arguments presented herein above to indicate that the present invention employs SAM's to pattern thin films that are more than one molecular layer of material and do not require chemical binding to the substrate surface.

**Claim 1, as amended, defines the thin films to clearly exclude such monolayers.**

Kumar et al. disclose a method of forming a patterned thin film by: (1) providing a substrate having a patterned layer of a self-assembled monolayer (SAM) thereon; and (2) depositing **a second self-assembled monolayer (SAM)** thereover.

In contrast to Kumar et al., instant claim 3 defines a method in which **a thin film material** is deposited on a surface of a substrate having thereon a patterned underlayer of a self-assembled monolayer. **The thin film in claim 3 is not a self-assembled monolayer**. Instead, the thin film material is clearly described to be as follows: "an organic molecule, a short-chain organic oligomer, a long-chain organic polymer, a photoresist, an organic-inorganic hybrid material, a metallo-organic complex, a nanoparticle of metal, a nanoparticle of metal oxide, a nanoparticle of semiconductor, a silica particle, an inorganic salt, and a mixture thereof."

The method of Kumar et al. **always deposits a second self-assembled monolayer (SAM)** over a first self-assembled monolayer (SAM), a feature that is not present in instant claim 3. There is no teaching or suggestion in Kumar et al. to deposit a thin film of an organic molecule, a short-chain organic oligomer, a long-chain organic polymer, a photoresist, an organic-inorganic hybrid material, a metallo-organic complex, a nanoparticle of metal, a nanoparticle of metal oxide, a nanoparticle of semiconductor, a silica particle, an inorganic salt, and a mixture thereof. Instead, Kumar et al. teaches to deposit a second self-assembled monolayer (SAM) over a first self-assembled monolayer (SAM), a feature that is not present in instant claim 3. Accordingly, all the elements of instant claim 3 are not present in Kumar et al.

To establish a *prima facie* case of obviousness, all the elements of a claim must be present or described in a cited reference with a suggestion to modify the reference to arrive at the claimed invention. A teaching or suggestion of how to modify the reference to arrive at the claimed invention is one of the essential requirements that must be met to establish a *prima facie* case of obviousness (see MPEP § 2142 and *In re Rouffet*, 47 USPQ 2d at 1457-1458).

The method of Kumar et al. always deposits **a second self-assembled monolayer (SAM)** over a first self-assembled monolayer (SAM), a feature that is not present in instant claim 3.

There is no teaching or suggestion in Kumar et al. to modify the method of Kumar et al. by depositing a thin film of an organic molecule, a short-chain organic oligomer, a long-chain organic polymer, a photoresist, an organic-inorganic hybrid material, a metallo-organic complex, a nanoparticle of metal, a nanoparticle of metal oxide, a nanoparticle of semiconductor, a silica particle, an inorganic salt, and a mixture thereof, on a surface of a substrate having thereon a patterned underlayer of a self-assembled monolayer instead of depositing a second self-assembled monolayer (SAM) over a first self-assembled monolayer (SAM).

Accordingly, the criteria for establishing a *prima facie* case of obviousness have not been met (see MPEP 2143, citing *In Re Vaeck*, 947 F.2d 488, 20 USPQ 2d 1438 (Fed. Cir. 1991)). Therefore, the rejection of claim 3 under 35 U.S.C. § 103(a), as being obvious over U.S. Patent No. 5,512,131 to Kumar et al. is improper and should be withdrawn.

Claim 13 is rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,512,131 to Kumar et al. in view of U.S. Patent No. 6,020,047 to Everhart and U.S. Patent No. 5,059,258 to Wefers et al.

The Office Action states that Kumar et al. "disclose a method for the formation of a patterned thin film on a substrate having a patterned SAM underlayer". This statement is incorrect. Kumar et al. discloses **depositing a second self-assembled monolayer (SAM) over a first self-assembled monolayer (SAM)**. This is a feature that is not present in instant claim 13.

Claim 13 depends from claim 5, which, in turn, depends from claim 1, thus incorporating all the limitations of claims 5 and 1.

Applicant has amended claim 1 to define that **the thin film deposited by the method of the present invention is not a monolayer**. Instead of repeating, the Examiner is referred to the arguments presented herein above to indicate that the present invention employs SAM's to pattern thin films that are more than one molecular layer of material and do not require chemical binding to the substrate surface.

**Claim 1, as amended, defines the thin films to clearly exclude such monolayers.**

Thus, claim 13 describes a method of forming a patterned thin film of an organic molecule, a short-chain organic oligomer, a long-chain organic polymer, a photoresist,

an organic-inorganic hybrid material, a metallo-organic complex, a nanoparticle of metal, a nanoparticle of metal oxide, a nanoparticle of semiconductor, a silica particle, an inorganic salt, and a mixture thereof, on a substrate having a patterned SAM underlayer.

Wefers et al. discloses the use of phosphonic species in the formation of SAMs on oxidized metal substrates. However, Wefers et al. **does not** disclose a method for the formation of a patterned thin film of an organic molecule, a short-chain organic oligomer, a long-chain organic polymer, a photoresist, an organic-inorganic hybrid material, a metallo-organic complex, a nanoparticle of metal, a nanoparticle of metal oxide, a nanoparticle of semiconductor, a silica particle, an inorganic salt, and a mixture thereof, on a substrate having a patterned SAM underlayer.

Everhart discloses a film with patterned self-assembling monolayers on a polymer film coated with a metal alloy. However, Everhart **does not** disclose a method of forming a patterned thin film of an organic molecule, a short-chain organic oligomer, a long-chain organic polymer, a photoresist, an organic-inorganic hybrid material, a metallo-organic complex, a nanoparticle of metal, a nanoparticle of metal oxide, a nanoparticle of semiconductor, a silica particle, an inorganic salt, and a mixture thereof, on a substrate having a patterned SAM underlayer.

Thus, neither Kumar et al. nor Wefers et al. nor Everhart, either alone, or in combination, teach or suggest all the elements of the instant claim 13, nor do they teach or suggest how to modify one or more of the other references to arrive at the instantly claimed invention. Without such a teaching or suggestion, a person of ordinary skill in the art would not be motivated to combine the references.

Due to the dependence of claim 13 from claim 1, even if the references were combined, the combination still does not have all the elements of claim 13, namely **forming a patterned thin film of an organic molecule, a short-chain organic oligomer, a long-chain organic polymer, a photoresist, an organic-inorganic**

hybrid material, a metallo-organic complex, a nanoparticle of metal, a nanoparticle of metal oxide, a nanoparticle of semiconductor, a silica particle, an inorganic salt, and a mixture thereof, on a substrate having a patterned SAM underlayer.

The combination (1) does not have all the elements of claim 13, (2) does not provide motivation to modify the other reference to arrive at the claimed invention and (3) does not provide a reasonable expectation of success to arrive at instantly claimed invention as defined in claim 13 even if all three references were combined.

Thus, none of the essential requirements to establish a *prima facie* case of obviousness have met (see MPEP § 2142 and *In re Rouffet*, 47 USPQ 2d at 1457-1458). Therefore, the rejection of claim 13 under 35 U.S.C. § 103(a), as being obvious over U.S. Patent No. 5,512,131 to Kumar et al. in view of U.S. Patent No. 6,020,047 to Everhart and U.S. Patent No. 5,059,258 to Wefers et al. should be withdrawn.

Further, Applicants have amended claim 1 to define that the thin film deposited by the method of the present invention is not a monolayer. Instead of repeating, the Examiner is referred to the arguments presented herein above to indicate that the present invention employs SAM's to pattern thin films that are more than one molecular layer of material and do not require chemical binding to the substrate surface.

Claim 1, as amended, clearly defines the thin films to clearly exclude such monolayers.

Regarding the election of species, Applicants had previously elected for prosecution the invention of generic claims 1-4 and the first species encompassed by claims 5-13, but respectfully request that the claims drawn to the first and second species be rejoined upon indication of allowability of the generic claims 1 and 33.



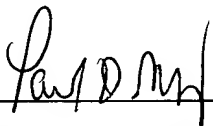
Based on the above, applicants respectfully request reconsideration of the present application, withdrawal of the 35 U.S.C. §102 (b) rejection and the 35 U.S.C. § 103(a) rejections and allowance of claims 1-22 and 24-33, including the allowable claims 12, 30 and 31 and the newly presented claims 32 and 33.

Accordingly, an early indication of the allowability of all pending claims by issuance of a Notice of Allowability is earnestly solicited.

Respectfully submitted,

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